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November 21, 1996

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William F. Caton, Secretary
Federal Communications Commission
1919 M Street, NW
Washington, DC 20554

Ref: MM Docket 87-268

Mr. Caton:

Enclosed find an original and 10 copies of my Reply Comments in the above captioned action for immediate distribution to the Commissioners and FCC staff.

Sincerely,


John S. Powell

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Before the
FEDERAL COMMUNICATIONS COMMISSION
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NOV 22 1996

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

In the Matter of)

Advanced Television Systems)
and Their Impact Upon the)
Existing Television Broadcast Service)

MM Docket #87-268

To: The Commission

**COMMENTS OF JOHN S. POWELL
ON THE
SIXTH FURTHER NOTICE OF PROPOSED RULEMAKING**

These comments are being submitted by a twenty-three year veteran police sergeant who "works the street" each shift supervising officers on a major public university campus in the metropolitan Eastbay area of San Francisco, California. I am concerned that my staff has access to state-of-the-art technologies, coupled with sufficient spectrum in which to properly implement and use them, to provide safe and efficient public safety services to our community. Importantly, with further action on this Docket, sufficient communications spectrum must be reallocated from television use to the Public Safety Radio Services so that emergency medical, fire, law enforcement and other public safety service providers can respond quickly to calls for assistance from both the public and our fellow personnel. Whether the need is for emergency medical, fire, law enforcement or a myriad of related health and welfare requirements, our common goal is that the public must be safe and public safety personnel must be able to return safely to their families at the end of each shift. There can be no higher domestic priority for the Commission than to take actions which promote those goals.

BACKGROUND

I am providing comments as an individual with significant communications background and experience. I graduated from the University of California at Berkeley with a BS degree in electrical engineering in 1973 and immediately began a law enforcement career with the UC Police Department; I was promoted to sergeant in 1977. I have supervised Patrol, Communications & Records, Administration, Special Projects, Crime Prevention and Emergency Preparedness. While assigned to Communications, I designed and implemented UC's E-911/Computer Assisted Dispatch Center and recently participated in the development and award of a contract for a statewide 800 MHz NPSPAC¹ trunked radio system serving all units of the University's nine campuses and four medical centers. I supervised a mutual aid unit in the city of Santa Cruz following the 1989 Loma Prieta earthquake and coordinated communications in a field command post during the 1991 Oakland Hills Fire. I have been a member of the Association of Public Safety Communications Officials, International (APCO) for 24 years, serving as President of the Northern California Chapter for two terms and as President of APCO International, during 1992-93. I chaired APCO's Law Enforcement Advisory Committee for three years, was President of the APCO Automated Frequency Coordination² (AFC) Board of Directors for three years and have been a member of APCO Project 25's Steering Committee since its inception in 1989, co-chairing Project 25 during 1992-93. As a member of the APCO Board and as APCO President, I had the opportunity to work closely with the FCC and Congress to address important issues of Spectrum Refarming, the protection of state/local government 2 GHz microwave assignments, the allocation of new public safety spectrum, and securing a Congressional mandate for a public safety spectrum needs study

¹ The National Public Safety Planning Advisory Committee (NPSPAC) developed recommendations adopted by the Commission for the 821-824/866-869 MHz public safety band; see *Report & Order*, Docket 87-112.

² APCO AFC is the wholly-owned non-profit subsidiary of APCO which performs frequency coordination functions in the Police and Local Government Radio Services and for all public safety services in the 420 and 800 MHz bands assigned to APCO by the FCC.

in the Omnibus Budget Reconciliation Act of 1993³. During the recent Public Safety Wireless Advisory Committee (PSWAC) process, I served as a member of APCO's PSWAC Task Force and participated actively on all of the subcommittees, particularly Interoperability (where I chaired the Future Interoperability Needs Working Group), Spectrum Requirements, and Technology. I have been a member of the California Legislature's Joint Committee on Fire, Police, Emergency and Disaster Services and currently serve as a member of the California Governor's Office of Emergency Services (OES) CLEMARS⁴ Advisory Committee. I am a life member of APCO, a member of the Communications Committee of the International Association of Chiefs of Police (IACP), a member of the Institute of Electrical and Electronic Engineers, and a fellow of the Radio Club of America.

Based on this experience, I am submitting these comments as an individual. They do not necessarily represent the views of my employer nor any of the above organizations, many of which will be submitting their own comments on these issues. Below, I present several options on spectrum allocation which will, at the least, be controversial. However, it is important that they be presented to allow for further comment from interested parties.

³ Public Law #103-66, Title VI, §6002, 107 Statute 312 [47 CFR §309(j)(10)(B)iv].

⁴ The California Law Enforcement Mutual Aid Radio System (CLEMARS) is the nation's largest law enforcement mutual aid radio system with over 48,000 portable, mobile and base stations licensed by the FCC.

INTRODUCTION

This *Sixth Further Notice* is, hopefully, one of the last steps the Commission will take in converting this nation's antiquated analog television system from a 50+ year old design into a state-of-the-art robust system capable of distributing a wide variety of digital signals. In addition to supporting multiple NTSC-equivalent digital (or Standard Definition Television - SDTV) signals multiplexed onto a single carrier, it provides a high definition (HDTV) mode that offers significant improvements in picture and sound quality. At the heart of this proceeding is an opportunity for the Commission to adjust television channel allocations, providing expanded television services with significant reductions in required broadcast spectrum. Broadcast television is the single largest user of radio spectrum in the bands below 1 GHz, bands whose characteristics make them the most suitable for mobile communications technologies. While other users of the radio spectrum have divided their channel widths time and again during the life of the current analog television technology, we have seen no improvement in television spectrum allocations since the first allocation, save for the taking of severely underutilized UHF channels 70-83 for land mobile (including public safety and cellular telephone) use in 1970 and sharing of spectrum in TV channels 14-20 with private land mobile radio systems in 13 major metropolitan areas in Docket 18261. In any case, the amount of information transmitted per Hertz of television spectrum is orders of magnitude less than that for state-of-the-art technologies, particularly those using digital formats and modulation.

The modulation being proposed further removes analog television "taboos" which resulted in half of the available television channels being unusable in any given area to prevent interference to operational stations on adjacent television channels.

As this *Notice* was being prepared for release, the Commission was completing another critical action. On September 11, 1996, the Public Safety Wireless Advisory Committee (PSWAC) transmitted its *Final Report* to the Commission and to the National Telecommunications and Information Administration (NTIA). The *Final Report* represents the most comprehensive assessment of Public Safety communications needs ever compiled. Its conclusion that immediate action is necessary by the Federal government to avert a public safety crisis can not go unheeded. APCO, the IACP and other public safety organizations have long urged the Commission to address the serious spectrum shortages facing public safety agencies. Without access to new and interference-free spectrum, public safety agencies will be unable to provide even basic emergency communications and will certainly be unable to implement new communications networks and technologies that will enhance their ability to protect the safety of life and property in coming years.

Virtually every after-action report following major disasters and interagency task force operations cites a lack of communications interoperability as a major problem. New spectrum allocations are necessary to provide critical interoperability between public safety agencies that must communicate on a daily basis, as well as during an ever increasing number of natural and technological disasters, to coordinate emergency response activities. The *Final Report* recommends the immediate allocation of 2.5 MHz in the 138-512 MHz band.

Unfortunately, the PSWAC process finished its work before this *Sixth Further Notice* was released. Fortunately, this *Sixth Further Notice* includes a channel allotment that could lead to the immediate reallocation of a portion of the spectrum now used for UHF television channels 60-69. That spectrum is adjacent to the 800 MHz mobile radio bands already used by a number of public safety agencies, and would therefore facilitate development of equipment that would be interoperable with current public safety systems. This spectrum could be used to implement new public safety communications technologies and to provide

spectrum relief in congested metropolitan areas. Furthermore, proposed changes to current broadcast television channel assignments present interesting opportunities to secure the additional public safety spectrum in the most critical public safety bands below 512 MHz for interoperability and to build wide area systems, as recommended in the PSWAC *Final Report*. A lack of overlap between completion of the PSWAC *Final Report* and the release of this *Sixth Further Notice* did not allow the PSWAC Subcommittees any time to formally review the MM 87-268 proposal. However, significant discussion regarding the DTV proposal has taken place among a number of former Subcommittee members. This discussion is the basis of several of the options presented below.

Spectrum that is critically needed for public safety use now and in the future can not be allowed to be auctioned or otherwise used in a manner of secondary importance to the needs of public safety, mandated in the Communications Act as second in priority only to the national defense.

REALLOCATION OF BROADCAST SPECTRUM: A CONTINUING GOAL OF TELEVISION RELATED PROCEEDINGS

As previously noted, the Commission time, in Docket 18261⁵, provided for sharing of spectrum in UHF-TV channels 14-20 with private land mobile radio systems in the 10 largest metropolitan areas (later expanded to 13 metropolitan areas). At the same time in another television proceeding⁶ the Commission ordered that television translator stations be cleared from UHF-TV channels 70-83 in these same 10 metropolitan areas so that these frequencies could be used by land mobile systems; translator stations in other areas of the country

⁵ See Reallocation of UHF-TV Channels 14 to 20 to the Land Mobile Radio Services, First Report and Order, 23 FCC2d 325 (1970).

⁶ See Future Use of the 806-960 Mhz Band, First Report and Order and Second Notice of Inquiry, 19RR2d 1663, 1666-1667 (1970).

were relegated to secondary status and eventually removed as new land mobile services, including cellular telephone and 800 Mhz trunked and Specialized Mobile Radio systems, came on line.

Again in 1985, the Commission began to explore the possibility of further land mobile sharing of underutilized television spectrum in other major urban areas which had a critical shortage of spectrum.⁷ While this possibility of further sharing was put on hold in 1987⁸ with the advent of this proceeding to develop a plan for High Definition Television⁹, the Commission nonetheless realized in its *Notice* the obligation to support “essential public services such as police and fire protection, medical assistance...”.

While the Commission has gone through the various phases of this television proceeding in the intervening 9+ years, the critical need for public safety spectrum has only continued to increase. Indeed, in Paragraph 16 of this *Further Notice*, the Commission reiterates its statement from its *Fourth Further Notice* “... that as part of our long term plans to promote efficient use of spectrum, we are considering reducing the amount of spectrum allocated to television broadcasting, but without reducing the number of licensees.” The Commission is required, in all of its spectrum allocation proceedings, to consider the impact of its decisions on the safety of life and property.¹⁰ It is now time for the Commission to make a final decision in this matter and to provide spectrum allocations based on priorities established by law.

⁷ See Further Sharing of the UHF Television Band by Private Land Mobile Services, Notice of Proposed Rulemaking, 101 FCC2d 852 (1985).

⁸ See Further Sharing of the UHF Television Band by Private Land Mobile Services, Order, 2 FCC Rcd 6441 (1987).

⁹ See Advanced Television Systems, Notice of Inquiry, 2 FCC Rcd 5125 (1987).

¹⁰ See 47 USC §151.

THE CONCEPT OF DTV CORE CHANNELS

In Paragraph 35 of this Notice, the Commission seeks comments on its "core area" concept. I generally agree with the Commission's findings relative to the lower VHF television channels (channels 2-6). Further, I strongly support the "core area" concept. However, as stated below, modifications to the particular channels selected for the core area will have significant benefit to other spectrum users, primarily state and local public safety agencies. Before proceeding with several spectrum options, it is important to describe how I arrived at needing an additional 12 MHz of public safety spectrum in the immediate future from within the 138-512 MHz band, an allocation that can only be realized by reallocation of television spectrum.

The need for spectrum for wide area systems can not be overemphasized. Many state police and highway patrol agencies currently use VHF low band (40-50 MHz) as their primary band. Major manufacturers have recently notified the California Highway Patrol (CHP) that they will no longer be manufacturing base station equipment for this band. In California, there is no affordable alternative except for spectrum in the 138-512 MHz bands.¹¹ While states such as Florida and Michigan have moved to 800 MHz, the terrain and size of the systems differ significantly as compared to California and other western states. Dr. Gregory Stone prepared a detailed radio coverage study which was filed by Quantum Radionics Corporation as part of its reply to WT Docket 96-86¹². The study, based on specific parametric assumptions using accepted engineering principles for public safety systems, found that the frequency dependent percentage of coverage with respect to a 160 MHz system was 70% at 406 MHz and 40% at 850 MHz in the Los Angeles area; for New York City it was

¹¹ A mid-1980s study by the CHP identified the need to construct over 50 new sites to maintain their mobile coverage contours if they moved to 800 MHz. Prices today often exceed \$200,000 to acquire, develop, construct and equip a new site. Coupled with the current requirement to provide portable coverage in much of their service area, the cost has become prohibitive to move to the 800 MHz band.

¹² See Quantum Radionics Corp filing, FCC WT Docket 96-86, October 21, 1996, page 8.

68% at 406 MHz and 55% at 850 MHz. These reduced percentages translate directly to added cost to build infrastructure at these higher frequencies.

Many states are now examining the possibility of building consolidated statewide systems serving all state agencies. The belief was that, if requirements could be met for the State of California, they could in all probability be met for any other state. With that in mind, discussion ensued as to how much spectrum would be required for their system. California has long believed that they could build a workable system within a 6 MHz allocation in the 138-512 MHz band, leaving some spectrum for other users and noting that significant other spectrum now in use would be released as agencies moved to the consolidated system.

This need extends beyond voice systems to the myriad of new technologies waiting to be introduced. Again, it will be cost prohibitive to build these systems, particularly in rural and mountainous areas, on spectrum in bands above 512 MHz.

The Public Safety Wireless Network (PSWN)¹³ is discussed in detail in the PSWAC *Final Report*. It is important to summarize the need for this network. It is envisioned that PSWN can function as "a private,

¹³ Vice-President Gore, in his program for a National Information Infrastructure, called for development of a national law enforcement and public safety wireless network. This network would provide the backbone and distribution medium(s) for voice and for advanced technology between information processing centers/repositories and field personnel at all layers of government.

On April 20, 1994, the Federal Law Enforcement Wireless Users Group (FLEWUG), co-chaired by the Justice and Treasury Departments, was formally chartered and tasked with research and planning for such a network. The FLEWUG plays an important function within the National Performance Review's charter to "Reengineer Through the Use of Information Technology." Its mission is clearly stated in the NPR Information Technology IT-04 Vision Statement:

"To provide law enforcement and public safety an integrated wireless/wireline network that meets the functional requirements of the user community. As envisioned, the network will incorporate spectrally efficient technologies, support interoperability, and be secure. Network planning and development will be sensitive to individual agency issues such as priorities and privacy, will provide virtual autonomy and non-interfering operations, and will include flexibility to expand and extend capabilities. Cooperative and coordinated system development efforts between multiple agencies will relieve the effects of diminishing resources such as funding and radio spectrum and will result in numerous cost and quality of service advantages."

wireless public-safety lane on the information superhighway,” offering those features of reliability, interference protection, ubiquitous coverage, user control, excess capacity, immediacy, and security, that commercial providers are unlikely to provide, particularly in more rural environments. I presented a plan to members of the PSWAC Spectrum and Interoperability Subcommittee at the close of the PSWAC deliberations. This plan coupled 14 PSWN channel pairs (each pair consists of two 125 kHz channels capable of supporting a data speed of 384 kbps) with the 2.5 MHz of interoperability spectrum described in the PSWAC *Final Report* above, for a total of 6 MHz, the bandwidth of one broadcast television channel; channel layout was appropriate to support mobile relay use of both the 40 voice channel pairs and the 14 PSWN pairs.

The first opportunity to allocate additional spectrum for public safety is within TV channels 60-69 which occupy spectrum immediately adjacent to the 800 MHz frequency bands used today by many public safety agencies. While I strongly support this concept and praise the Commission for its leadership in clearing this spectrum block, I note with concern that the proposed allocation table in this *Further Notice* leaves a number of TV channels remaining on this spectrum in major metropolitan areas. Importantly, according to that table, there is no common spectrum available for public safety in the TV 60-69 band nationwide!

A second alternative for additional 800 MHz spectrum would relieve the FCC Wireless Telecommunications Bureau's current problem with attempting to auction SMR spectrum in the lower 800 MHz band where licensing is currently frozen. Considering the embedded base of public safety equipment in this lower band on frequencies which are interleaved so that it is virtually impossible to consider the spectrum as a block, the

In April, 1996, the US Justice Department formally authorized and funded the FLEWUG Program Management Office (PMO). "The purpose of the PMO is to organize, direct and manage the multitude of tasks that must be completed..... the PMO will receive guidance and direction from the FLEWUG in coordination with participating state and local "partners." The PMO will establish project teams made up of experts drawn from government, industry and academia to address specific items of interest. Such teams will be assembled on an as-needed basis and dismissed when their work is completed.

Commission could examine auctioning spectrum in the TV 60-69 band for ESMR and other commercial uses, releasing an equivalent portion of spectrum in the 806 MHz band for public safety use. The benefit of this option to public safety is that virtually all existing NPSPAC equipment is capable of operating throughout the 806-824/851-869 MHz bands, providing immediate interoperability and growth opportunities without replacement of equipment.

The most important spectrum opportunity presents itself in the lower TV channels. The PSWAC Spectrum Subcommittee clearly documented the need for spectrum for wide area systems and for interoperability in the 138-512 MHz bands where most public safety systems operate today, bands which are also occupied by TV channels 7-20. In particular, as part of the DTV channel allotment, moving the bottom of the "core DTV spectrum" up to the base of channel 9 (187 MHz) would make available an additional 12 MHz of VHF spectrum immediately adjacent to existing public safety spectrum used by federal, state and local agencies. In particular, I would propose that TV-7 (174-179 MHz) be allocated for interoperability and TV-8 (180-186 MHz) be allocated primarily for wide areas systems.

A careful examination of the proposed DTV allocation tables presents yet another option for spectrum in the 470-512 MHz band. With the intent of clearing all broadcast television use from TV channels 14-18 (470-500 MHz), a manual repacking of the tables for the San Francisco area was completed. It appears possible to clear these channels with minimum coverage impact on the television stations, as described later in this section. As it appears that the Commission made minimal use of terrain features in making co-channel assignments of DTV stations, it was possible with knowledge of local terrain to space stations much closer than the proposed allocations. Clearing these 5 UHF channels will provide a minimum of 12 MHz additional spectrum throughout the United States (Los Angeles and New Your City are already using 18 MHz in this

band). This option proposes designating TV-14 (470-476 MHz) as interoperability/PSWN spectrum because it falls closest to existing public safety spectrum at 450-470 MHz. A number of manufacturers make broadband radios today that cover the 450-486 MHz band. This would require eventually relocating existing TV-14 users to one of the other channels in the 15-18 block, but would provide all areas of the country with at least 6 MHz of new spectrum (areas other than LA and NYC would receive substantially more) above and beyond the new public safety interoperability band. The additional 6 MHz would be usable for building wide area systems such as those envisioned by some states (including California and Colorado). A preliminary examination shows that 470-500 MHz could likewise be cleared in Southern California (although public safety users currently sharing the 500-512 MHz band would also eventually have to relocate to lower channels).

While the 174-186 MHz spectrum might appear more desirable, the apparent philosophy of the Commission in allocating new and transition TV channels for DTV is to provide new channels with coverage that is consistent with that of the original TV assignment. That has resulted in stations being authorized extremely high effective radiated powers (often exceeding 3 megawatts) for assignments moving from VHF channels to UHF channels. Because these power levels, coupled with placing a significant number of such high powered stations at popular sites such as the World Trade Center in New York City and Sutro Tower in San Francisco, would pose significant costs and public health risks, it is anticipated that these VHF stations will desire to convert to DTV while maintaining their current VHF assignments, where possible. However, for stations already operating at UHF, whether they move into 470-500 MHz spectrum or are forced slightly higher (just above 500 MHz) has little impact on their operating parameters. Thus claiming the 470-500 MHz spectrum for public safety use may prove more feasible than its VHF alternative.

MAXIMUM PACKING OF DTV CORE SPECTRUM

In order to maximize spectrum reuse and reclaim the maximum amount of television broadcast spectrum for other uses, the Commission must take steps to ensure that:

1. Broadcast stations are offered conversion options that meet their budget and operational requirements;
2. An acceptable plan is developed to clear needed public safety interoperability and operational spectrum as quickly as possible;
3. Final broadcast channel packing is maximized.

Broadcast stations must be offered conversion options that meet their budget and operational requirements:

A recent survey¹⁴ of 400 television executives representing 479 stations (over 25% of the market) by Harris Corporation, a large manufacturer of television station transmitter equipment with contracts to provide DTV transmitters to several station groups found the following:

- 28% of broadcast executives surveyed didn't hope DTV happens;
- 21% don't plan to convert within 5 years;
- 65% said that the conversion would be less than \$5 million;
- Only 63% (of top 50 market stations) said they could afford conversion;

¹⁴ *Communications Daily*, Wednesday, November 13, 1996, page 9.

Clearly there is significant broadcast opposition to the proposed conversion plan. However, the DTV standard provides an alternative which will reduce costs for those stations which do not need, intend, nor may be able to afford the conversion to transmission of an HDTV signal¹⁵. It is not simply a matter of changing out equipment; there are many associated factors. For example, a change in output power or frequency may require a change in antennas. Will the existing tower be able to take the weight and wind loading of the new antenna and waveguide? 6 1/8" Hard Line rigid coax can run at average powers of up to about 100 kW. At powers beyond that, 9" waveguide may be required with associated wind and ice loading on the tower. If so, a new tower may be needed, costing in the million dollar range for big towers. Furthermore, with the anticipated cost of HDTV cameras approaching \$100,000 it is doubtful that many smaller stations will choose to originate HDTV broadcasts. However, as previously stated, the standard allows for multiplexing up to five (5) SDTV signals onto a single DTV transmission carrier requiring only a single 6 MHz channel to carry the 5 stations.

The Commission should provide a mechanism and allow a minimum time period (no longer than 3 years) for stations to determine whether they will convert to HDTV or to negotiate an agreement with other local stations in their area to consolidate into a multiplexed SDTV system. As part of this process, stations should be required to certify to the Commission that funding is available, provide detailed engineering and coverage studies, and provide a time line for construction of their DTV facilities.

¹⁵ Such stations might include educational, religious, home shopping, community and related types of stations with restricted budgets and types of programming which can not take full advantage of the higher quality HDTV signal.

An acceptable plan must be developed to clear needed public safety interoperability and operational spectrum as quickly as possible:

While the broadcast stations are determining their course of action as detailed in #1 above, the Commission should impanel a blue-ribbon committee of broadcast representatives and public safety users with liaison to appropriate Congressional committees to determine the most appropriate interoperability spectrum to immediately clear below 512 MHz and to identify additional TV spectrum to be cleared, both short and long term. As this committee identifies eventual public safety spectrum that is available immediately by sharing, the Commission must take necessary regulatory action to allow its immediate shared use by public safety agencies.

Final broadcast channel packing must be maximized.

The Draft Channel Plan in this *Notice* lists a total of 1663 television stations. These existing stations are packed at a density of approximately 58 stations/channel nationwide on the 12 VHF channels. Further, it should be noted that existing VHF stations tend to cover wider service areas than their UHF counterparts, both due to propagation characteristics and because the major networks tend to use the majority of the VHF stations. With reduced interference and elimination of NTSC taboos, the Commission's new DTV channeling plan should be able to exceed this density.

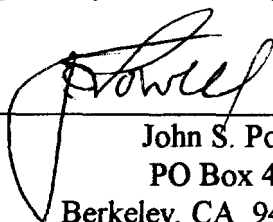
The Draft Channel Plan appears to be almost totally based upon mileage separation between stations. Any realistic plan must include a number of additional parameters, some of which can only be derived after technical decisions are made by individual stations (power levels and antenna patterns, for example). A critical element that appears to be lacking from the Draft Plan is the impact of terrain on signal paths; this is particularly important in mountainous areas.

With appropriate terrain and technical parameters, coupled with decisions by what may prove to be a significant number of broadcast stations to multiplex SDTV signals onto a single DTV carrier in each local area, it is believed that the Commission could reduce the core television spectrum to about 32 channels while still providing sufficient spectrum for new stations and for low powered translator stations.

CONCLUSIONS

In addressing spectrum issues surrounding this *Sixth Further Notice*, the Commission must take immediate and decisive steps to ensure that public safety agencies will have the required spectrum, systems and support needed to effectively and efficiently protect and serve the public. To that end, the Commission must implement the recommendations of the PSWAC *Final Report*. A failure by the Commission to take these steps will result in a public safety communications crisis that threatens the lives of public safety officers and the citizens of this great nation.

Respectfully Submitted by:

A handwritten signature in black ink, appearing to read "J. Powell", is written over a horizontal line.

John S. Powell
PO Box 4342
Berkeley, CA 94704-0342

November 22, 1996